The Fall of Mercury in the Barometer		The Height of the Atmosphere, as it answers to every Line in the Barometer, according to Mariotte.				According to Cassini.		According to Dr. Scheuchzer.				The Height of the Atmosphere above the Level of the Sea, according to Mariotte.				According to Cassini.		According to Dr. Scheuchzer.				Height of the Mercury in th: Barometer.	
''	'''	o	'	''	'''	o	'	o	'	''	'''	o	'	''	'''	o	'	o	'	''	'''	''	'''
0	0	10	3	0	0	10	0	10	4	6	9	0	0	0	0	0	0	0	0	0	0	28	0
	1	10	3	2	3	10	1	10	4	9	2	10	3	2	3	10	1	10	4	9	2	—	11
	2	10	3	4	6	10	2	10	4	11	5	21	0	6	9	20	3	21	3	8	7	—	10
	3	10	3	6	10	10	3	10	5	1	1	31	4	1	7	31	0	32	2	9	8	—	9
	4	10	3	9	1	10	4	10	5	4	1	42	1	10	8	41	4	43	2	1	9	—	8
	5	10	3	11	4	10	5	10	5	6	6	52	5	10	0	52	3	54	1	8	3	—	7
	6	10	4	1	9	11	0	10	5	8	11	63	3	11	9	63	3	65	1	5	2	—	6
	7	10	4	4	1	11	1	10	5	11	3	74	2	3	10	74	4	76	1	4	5	—	5
	8	10	4	6	5	11	2	11	0	1	8	85	0	1	8	86	0	87	1	6	1	—	4
	9	10	4	8	10	11	3	11	0	4	1	95	5	7	1	97	3	98	1	10	2	—	3
	10	10	4	11	2	11	4	11	0	6	6	106	4	6	3	109	1	109	2	4	8	—	2
	11	10	5	1	7	11	5	11	0	8	11	117	3	7	10	121	0	120	3	1	7	—	1
1	0	10	5	4	0	12	0	11	0	11	4	128	2	11	10	133	0	131	4	0	11	27	0
	1	10	5	6	5	12	1	11	1	1	10	139	2	6	3	145	1	142	5	2	9	—	11
	2	10	5	8	10	12	2	11	1	4	4	150	2	3		157	3	154	0	7	1	—	10
	3	10	5	11	1	12	3	11	1	6	10	161	2	2	5	170	0	165	2	1	11	—	9
	4	11	0	1	9	12	4	11	1	9	5	172	2	4	2	182	4	176	3	11	4	—	8
	5	11	0	4	3	12	5	11	2	0	0	183	2	8	5	195	3	187	5	11	4	—	7
	6	11	0	6	9	13	0	11	2	2	7	194	3	3	2	208	3	199	2	1	11	—	6
	7	11	0	9	3	13	1	11	2	5	2	205	4	0	5	221	4	210	4	7	1	—	5
	8	11	0	11	10	13	2	11	2	7	9	216	5	0	3	235	0	221	1	2	10	—	4
	9	11	1	2	4	13	3	11	2	10	4	228	0	2	7	248	3	233	4	2	2	—	3
	10	11	1	4	11	13	4	11	3	1	0	239	1	7	6	262	1	245	1	3	2	—	2
	11	11	1	7	7	13	5	11	3	6	4	250	3	3	1	276	0	256	4	9	6	—	1
2	0	11	1	10	2	14	0	11	3	9	0	261	5	1	3	290	0	268	2	6	6	26''	0
	1	11	2	0	9	14	1	11	3	11	8	273	1	2	0	304	1	280	0	6	2	—	11
	2	11	2	3	4	14	2	11	4	2	4	284	3	5	4	318	3	291	4	8	6	—	10
	3	11	2	6	0	14	3	11	4	5	0	295	5	11	4	333	0	303	3	1	6	—	9
	4	11	2	8	8	14	4	11	4	7	8	307	2	8	0	347	0	315	1	9	2	—	8
	5	11	2	11	4	14	5	11	4	10	4	318	5	1	4	362	3	327	0	7	6	—	7
	6	11	3	2	1	15	0	11	5	1	0	330	2	9	5	377	3	338	5	8	6	—	6
	7	11	3	4	10	15	1	11	5	3	9	342	0	2	3	392	4	350	5	0	5	—	5
	8	11	3	7	7	15	2	11	5	6	7	353	3	9	10	408	0	362	4	7	0	—	4
	9	11	3	10	4	15	3	11	5	9	5	365	1	8	2	423	3	374	4	4	5	—	3
	10	11	4	1	1	15	4	12	0	0	5	376	5	9	3	439	1	386	4	4	10	—	2
	11	11	4	3	11	15	5	12	0	3	5	388	4	1	2	455	0	398	4	8	3	—	1
3	0	11	4	6	9	16	0	12	0	6	6	400	2	7	11	471	0	410	5	2	9	25	0
	1	11	4	9	6	16	1	12	0	9	8	412	1	5	5	487	1	423	0	0	5	—	11
	2	11	5	0	4	16	2	12	1	0	10	424	0	5	9	503	3	435	1	1	3	—	10
	3	11	5	3	3	16	3	12	1	4	0	435	5	9	0	520	0	447	2	5	3	—	9
	4	11	5	6	2	16	4	12	1	7	2	447	5	3	2	536	4	459	4	0	5	—	8
	5	11	5	9	1	16	5	12	1	10	4	459	5	0	3	553	3	471	5	10	9	—	7
	6	12	0	0	0	17	0	12	2	1	6	471	5	0	3	570	3	484	2	0	3	—	6
	7	12	0	2	11	17	1	12	2	4	8	483	5	3	2	587	4	496	4	4	11	—	5
	8	12	0	5	11	17	2	12	2	8	0	495	5	9	1	605	0	509	1	0	11	—	4
	9	12	0	8	11	17	3	12	2	11	2	508	0	6	0	622	3	521	4	0	1	—	3
	10	12	0	11	11	17	4	12	3	2	4	520	1	5	11	640	0	534	1	2	5	—	2
	11	12	1	2	11	17	5	12	3	5	8	532	2	8	10	658	0	546	4	8	1	—	1
4	0	12	1	6	0	18	0	12	3	8	10	544	2	3	10	676	0	559	2	4	11	24	0
	1	12	1	9	1	18	1	12	4	0	0	556	5	11	11	694	1	572	0	4	11	—	11
	2	12	2	0	2	18	2	12	4	3	2	569	2	0	1	712	3	584	4	8	1	—	10
	3	12	2	3	3	18	3	12	4	6	4	581	4	3	4	731	0	597	3	2	5	—	9
	4	12	2	6	5	18	4	12	4	9	6	594	0	9	9	749	4	610	1	11	11	—	8
	5	12	2	9	7	18	5	12	5	0	8	606	3	7	1	768	0	623	1	0	7	—	7
	6	12	3	0	9	19	0	12	5	3	10	619	0	1	1	787	3	636	0	4	5	—	6
	7	12	3	3	11	19	1	12	5	7	0	631	4	0	0	806	4	648	5	11	5	—	5
	8	12	3	7	2	19	2	12	5	10	2	644	1	7	2	826	0	661	5	9	7	—	4
	9	12	3	10	5	19	3	13	0	1	4	656	5	5	7	845	3	674	5	10	11	—	3
	10	12	4	1	9	19	4	13	0	4	6	669	3	7	4	865	1	688	0	3	5	—	2
	11	12	4	5	0	19	5	13	0	7	8	682	2	0	5	885	0	701	0	11	11	—	1
5	0	12	4	8	4	20	0	13	0	10	10	695	0	8	8	905	0	714	1	9	11	23	0
	1	12	4	11	8	20	1	13	1	2	3	707	5	8	4	925	1	727	3	0	2	—	11
	2	12	5	3	0	20	2	13	1	5	8	720	4	11	4	945	3	740	4	5	10	—	10
	3	12	5	6	5	20	3	13	1	9	1	733	4	3	9	966	0	754	0	2	11	—	9
	4	12	5	9	10	20	4	13	2	0	6	746				986		767				—	

Idx	col A	col B	col C		col D	col E	col F	R
1	10 5 0 5	12 1	11 1 4 4		139 2 8 5	145	142 5 2 9	— 11
2	10 5 8 10	12 2	11 1 6 10		150 2 3t.µt	157 3	154 0 7 1	— 10
3	10 5 11 1	12 3	11 1 9 5		161 2 2 5	170 0	165 2 1 11	— 9
4	11 0 1 9	12 4	11 1 9 5		172 2 4 2	182 4	176 3 11 4	— 8
5	11 0 4 3	12 5	11 2 0 0		183 2 8 5	195 3	187 5 11 4	— 7
6	11 0 6 9	13 0	11 2 2 7		194 3 3 2	208 3	199 2 1 11	— 6
7	11 0 9 3	13 1	11 2 5 2		205 4 0 5	221 4	210 4 7 1	— 5
8	11 0 11 10	13 2	11 2 7 9		216 0 3 5	235 0	221 1 2 10	— 4
9	11 1 2 4	13 3	11 2 10 4		228 0 2 7	248 3	233 4 2 2	— 3
10	11 1 4 11	13 4	11 3 1 0		239 1 7 6	262 1	245 1 3 2	— 2
11	11 1 7 7	13 5	11 3 6 4		250 3 3 1	276 0	256 4 9 6	— 1
2 0	11 1 10 2	14 0	11 3 9 0		261 5 1 3	290 0	268 2 6 6	26" 0
1	11 2 0 9	14 1	11 3 11 8		273 1 2 0	304 1	280 0 6 2	— 11
2	11 2 3 4	14 2	11 4 2 4		284 3 5 4	318 2	291 4 8 0	— 10
3	11 2 6 0	14 3	11 4 5 0		295 5 11 4	333 0	303 3 1 6	— 9
4	11 2 8 8	14 4	11 4 7 8		307 2 8 0	347 4	315 1 9 2	— 8
5	11 2 11 4	14 5	11 4 10 4		318 5 7 4	362 3	327 0 7 6	— 7
6	11 3 2 1	15 0	11 5 1 0		330 2 9 5	377 3	338 5 8 6	— 6
7	11 3 4 10	15 1	11 5 3 9		342 0 2 3	392 4	350 5 0 5	— 5
8	11 3 7 7	15 2	11 5 6 7		353 3 9 10	408 0	362 4 7 0	— 4
9	11 3 10 3	15 3	11 5 9 5		365 1 8 2	423 3	374 4 4 5	— 3
10	11 4 1 1	15 4	12 0 0 5		376 5 9 3	439 1	386 4 4 10	— 2
11	11 4 3 11	15 5	12 0 3 5		388 4 1 2	455 0	398 4 8 3	— 1
3 0	11 4 6 9	16 0	12 0 6 6		400 2 7 11	471 3	410 5 2 9	25 0
1	11 4 9 6	16 1	12 0 9 8		412 1 5 5	487 1	423 0 0 5	— 11
2	11 5 0 4	16 2	12 1 0 10		424 0 5 9	503 3	435 1 1 3	— 10
3	11 5 3 3	16 3	12 1 4 0		435 5 9 0	520 0	447 2 5 3	— 9
4	11 5 6 2	16 4	12 1 7 2		447 5 3 2	536 4	459 4 0 5	— 8
5	11 5 9 1	16 5	12 1 10 4		459 5 0 3	553 2	471 5 10 9	— 7
6	12 0 0 0	17 0	12 2 1 6		471 5 0 3	570 3	484 2 0 3	— 6
7	12 0 2 11	17 1	12 2 4 8		483 5 3 2	587 4	496 4 4 11	— 5
8	12 0 5 11	17 2	12 2 8 0		495 5 9 1	605 0	509 1 0 11	— 4
9	12 0 8 11	17 3	12 2 11 2		508 0 6 0	622 3	521 4 0 1	— 3
10	12 0 11 11	17 4	12 3 2 4		520 1 5 11	640 1	534 1 2 5	— 2
11	12 1 2 11	17 5	12 3 5 8		532 2 8 10	658 0	546 4 8 1	— 1
4 0	12 1 6 0	18 0	12 3 8 10		544 2 3 10	676 0	559 2 4 11	24 0
1	12 1 9 1	18 1	12 4 0 0		556 5 11 11	694 1	572 0 4 11	— 11
2	12 2 0 2	18 2	12 4 3 2		569 2 0 1	712 0	584 4 8 1	— 10
3	12 2 3 3	18 3	12 4 6 4		581 4 3 4	731 0	597 3 2 5	— 9
4	12 2 6 5	18 4	12 4 9 6		594 0 9 9	749 4	610 1 11 11	— 8
5	12 2 9 7	18 5	12 5 0 8		606 3 7 4	768 3	623 1 0 7	— 7
6	12 3 0 9	19 0	12 5 3 10		619 0 1 1	787 3	636 0 4 5	— 6
7	12 3 3 11	19 1	12 5 7 0		631 4 0 0	806 4	648 5 11 5	— 5
8	12 3 7 2	19 2	12 5 10 2		644 1 7 2	826 0	661 5 9 7	— 4
9	12 3 10 5	19 3	13 0 1 4		656 5 5 7	845 3	674 5 10 11	— 3
10	12 4 1 9	19 4	13 0 4 6		669 3 7 4	865 1	688 0 3 5	— 2
11	12 4 5 0	19 5	13 0 7 8		682 2 0 4	885 0	701 0 11 1	— 1
5 0	12 4 8 4	20 0	13 0 10 10		695 0 8 8	905 0	714 1 9 11	23 0
1	12 4 11 8	20 1	13 1 2 3		707 5 8 4	925 1	727 3 0 2	— 11
2	12 5 3 0	20 2	13 1 5 8		720 4 11 4	945 3	740 4 5 10	— 10
3	12 5 6 5	20 3	13 1 9 1		733 4 3 9	966 2	754 0 2 11	— 9
4	12 5 9 10	20 4	13 2 0 6		746 4 3 7	986 4	767 2 3 5	— 8
5	13 0 1 4	20 5	13 2 4 2		759 4 4 11	1007 3	780 4 7 7	— 7
6	13 0 4 9	21 0	13 2 7 10		772 4 9 8	1028 3	794 1 3 5	— 6
7	13 0 8 3	21 1	13 2 10 6		785 5 5 11	1049 4	807 4 1 11	— 5
8	13 0 11 10	21 2	13 3 3 2		799 0 5 9	1071 0	821 1 5 1	— 4
9	13 1 3 4	21 3	13 3 6 10		812 1 9 5	1092 3	834 4 11 11	— 3
10	13 1 6 11	21 4	13 3 10 6		825 3 4 0	1114 1	848 2 10 5	— 2
11	13 1 10 6	21 5	13 4 2 2		836 5 2 6	1136 0	862 2 0 7	— 1
6 0	13 2 2 2	22 0	13 4 5 10		852 1 4 8	1158 0	875 5 6 5	22 0
1	13 2 5 10	22 1	13 4 9 6		865 3 10 0	1180 1	889 4 4 11	— 11
2	13 2 9 6	22 2	13 5 1 2		879 0 8 0	1202 3	903 3 6 1	— 10
3	13 3 1 3	22 3	13 5 4 10		892 3 9 3	1225 0	917 2 10 11	— 9
4	13 3 5 2	22 4	13 5 8 6		906 1 2 5	1247 4	931 2 7 5	— 8
5	13 3 8 9	22 5	14 0 0 2		919 4 11 2	1270 3	945 2 7 7	— 7
6	13 4 0 7	23 0	14 0 4 2		932 2 11 9	1293 3	959 2 11 9	— 6
7	13 4 4 5	23 1	14 0 8 3		947 1 4 2	1316 4	973 3 8 0	— 5
8	13 4 8 3	23 2	14 1 0 4		961 0 0 5	1340 0	987 4 8 4	— 4
9	13 5 0 1	23 3	14 1 4 5		974 5 0 6	1363 3	1002 0 0 9	— 3
10	13 5 4 0	23 4	14 1 8 6		988 4 4 6	1387 1	1016 1 9 3	— 2
11	13 5 8 0	23 5	14 2 0 7		1002 4 0 6	1411 0	1030 3 9 10	— 1
7 0	14 0 0 0	24 0	14 2 4 8		1016 4 0 6	1435 1	1044 0 2 6	21 0
1	14 0 4 0	24 1	14 2 8 9		1030 4 4 6	1459 1	1058 2 11 3	— 11
2	14 0 8 0	24 2	14 3 0 10		1044 5 0 6	1483 3	1073 0 0 1	— 10

I. *The Barometrical Method of measuring the Height of Mountains, with two new Tables shewing the Height of the Atmosphere at given Altitudes of Mercury. Extracted chiefly from the Observations of* John James Scheuchzer, *M. D. Professor of Mathematicks at* Zuric, *and a Member of the Imperial, and Royal Societies of* London *and* Prussia. *By* J. G. Scheuchzer, *M. D. F. R. S. & Coll. Med. Lond. Lic.*

THE Height of Mountains, and their Elevation above the Level of the Sea, hath been at all Times thought worthy the Attention of inquisitive Philosophers. We find in *Pliny* *, that *Dicæarchus*, one of the old Geographers, a Disciple of *Aristotle*, and, as *Pliny* himself stiles him, a Man of great Learning, had by particular Order of some Princes measured the Heights of several Mountains, and that the highest of them, *Mount Pelius* in *Thessalia*, was found by his Observations 1250 Paces high perpendicularly. *Cleomedes* also, a *Grecian* Astronomer and Geographer, who lived sometime before our Saviour's Nativity, asserts †, that the highest Mountain cannot be above 15 Stadia, or 9375 *Roman* Feet high.

But *Plutarch* ‡ fixes the perpendicular Height of the highest Mountains, as also the greatest Depth of the Sea, only to 10 Stadia, or 6250 *Roman* Feet. It will appear by the Sequel of this Paper, that the

* Hist. Nat. L. xi. c. 65.   † Cyclicæ Theor. Cap. x.   ‡ In vita Aemilij.

Height

Height of Mountains, as determined by thefe early Writers, doth not fo very much deviate from Truth, as one would be apt to fufpect from the infant State of Arts and Sciences in thofe Times. Particularly the 15 Stadia of *Cleomedes*, which make out 9375 *Roman*, or 10,214 *Paris* Feet, will be found by the following Obfervations to come very near the Height of the Mountains of *Swifferland*, which, although the higheft of *Europe*, do not rife above 10,000 *Paris* Feet above the Level of the Sea; and it may feem furprizing, that fubfequent Writers, even fuch as were otherwife deeply skill'd in mathematical Learning, have run them up to an extravagant, and altogether unnatural Height.

At firft, it is not improbable, they went only upon bare Conjectures; but afterwards, when Geometry came to be more and more improved, Quadrants, Semicircles, and other Geometrical Inftruments were call'd in Ufe, by the Means of which, and by a Trigonometrical Calculation, the Heights of Places could be determined in a more fatisfactory Manner. And yet, however true the Principles be, upon which this Method is founded, however nice the Inftruments, and however curious the Obferver, the Method itfelf muft be owned, and hath been found by undoubted Experiments, to fall far fhort of that Accuracy, which it feems to promife; and the more confiderable the Heights are, the more uncertain it will be. For in the firft Place, as the State of the Air is very different in different Seafons and different Weather, its Refraction alfo becomes thereby greatly altered, which occafions the Tops of Mountains to appear higher at fome Times than they do at others, and at all Times higher than they actually are. But befides, there is another In-

2   conveniency,

conveniency, which whoever is acquainted with the true State of mountainous Countries, muft needs be fenfible of, and that is the extream Difficulty of meeting at the Bottom of high Mountains with Plains large enough for a proper horizontal Stand, or Bafis, to fuch a Triangle, as an accurate and knowing Obferver would think fatisfactory to determine a confiderable Height, making even proper Allowances for the Air's Refraction.

Among the many Improvements in Natural Philofophy, which are owing to the Toricellian Tube, one of the moft confiderable Inventions of the laft Century, it hath been thereby enriched with a new Method of meafuring the refpective Heights of Places, and their Elevation above the Level of the Sea; a Method, which, although it muft be owned, that it hath not as yet, and perhaps, confidering the Inconftancy of the Air, hardly ever will be brought to an abfolute Degree of Certainty, is yet in many Refpects preferable to the Trigonometrical one, as it hath alfo been found by Experience to come nearer the Truth, and leads us, by a new and fingular Scale, from the very Horizon of the Sea to the Tops of the higheft Mountains, a Diftance far beyond the Reach of Geometrical Inftruments. This new Method is grounded upon that effential Quality of the Air, its Gravity or Preffure. As the Column of Mercury in the Barometer is counterpoifed by a Column of Air of equal Weight, fo whatever Caufes will make the Air heavier or lighter, its Preffure will be thereby increafed, or leffened, and confequently the Mercury rife or fall. Again the Air is more or lefs condenfed, or expanded, in Proportion to the Weight, or Force, which preffes it: Hence it is, that

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in *England, Holland,* the maritime Provinces of *France,* and in general all thofe Countries which border upon the Sea, the Mercury ftands higheft, that the higher you remove from the Sea into the midland Countries, the lower the Mercury will defcend, becaufe the Air alfo becomes more rarefied and lighter, and that upon the Tops of the higheft Mountains it falls loweft, and thefe Heights of the Mercury in different Places are reciprocally, as the Expanfions of the Air. From thefe Principles, fupported by a competent Number of Obfervations, it hath been attempted by feveral learned Men, to derive proper Tables, whereby the Height of any Place may be determined, if the Height of the Barometer be given, or the Height of the Barometer determined from the given Altitude of the Place, and likewife the Expanfions of the Air fettled, as they anfwer to every Inch, or Part of an Inch, in the Barometer.

I pafs over the firft Experiment of this Kind, which was made in the Year 1648 (but a few Years after the Invention of the Torricellian Tube was made publick in *France* by Father *Merfenne*) by Monfieur *Perier,* according to the Directions of the celebrated Monfieur *Pafcal,* his Brother-in-Law, upon the high Mountain *Puy de Domme,* near *Clermont* in *Auvergne,* the Height whereof was thereby determined to 500 *French* Toifes, or 3000 *Paris* Feet. (See the Appendix to *M. Pafcal*'s *Traitè de l' Equilibre des Liqueurs* *.) Nor will my prefent Purpofe admit a particular Enumeration of thofe made fometime after, in 1661, 1665, and 1666, by *George Sinclair,* Profeffor of Philofophy in the Univerfity of *Glafgow,* upon the Cathe-

* *Paris,* 1663, 8vo. *pag.* 177.

dral

dral of that Univerſity, upon ſeveral high Mountains in *Scotland*, and likewiſe in ſome Wells and Coal-pits, a particular Account whereof he inſerted in his *Ars magna gravitatis & levitatis* *. I will only obſerve, that theſe Experiments of *Sinclair*, as well as that of Monſieur *Perier*, were intended not ſo much to lay the Foundation of a Calculation, whereby to determine the differing Heights of Places, as to prove the Gra-vity and Preſſure of the Air, a Problem very much controverted at that Time, and to ſhew, that the ſame is much more conſiderable in Valleys than at the Top of Mountains, and ſtill greater in Proportion at the Bot-tom of Wells, Mines, &c.

But this Matter was purſued ſtill farther by the Members of the Royal Academy of Sciences at *Paris*, particularly, when by Order of *Lewis* XIV, they drew that expenſive *Meridian* Line acroſs the whole Kingdom of *France*. M. *Mariotte*, a celebrated Mem-ber of that Academy, was one of the firſt that laid down certain Rules for the Conſtruction of ſuch Tables, as might ſerve to determine both the Elevation of Places above the Level of the Sea from given Altitudes of Mercury, and the Heights of the Air, anſwering to every Line of Mercury in the Barometer, from 28 ʺ, where the Mercury was ſuppoſed to ſtand at a Medium near the Sea. The Principles he went upon, and the Me-thod he followed, he diſcourſed of at large, in his *Second Eſſay de la Nature de l' Air*.

Sometime after, in 1686, the ingenious Dr. *Edmund Halley* went about another Calculation, which he de-rived partly from Principles agreeing with thoſe of

* Roterodami, 1669, 4to. *pag.* 129, 132, 134, 144, & ſeq.

M. Ma-

M. Mariotte, partly from the fpecifick Weight of Air and Mercury, which were found by Experiments to be as 1 to 10,800; Air being to Water as 1 to 800, and Water to Mercury as 1 to 13 $\frac{1}{2}$, or very near it. If fo, as the Column of Mercury in the Barometer is counterpoifed by a Column of Air of equal Weight, a Cylinder of Air of 10,800 Inches, or 900 Feet will be equal to one Inch of Mercury, and 90 Feet to $\frac{1}{10}$ of an Inch, or 75 to $\frac{1}{12}$ Part of it. The Height of the Air, as it anfwers to one Inch of Mercury, being thus determined, and the Expanfions of the Air being reciprocally as the Heights of Mercury, Dr. *Halley,* by the Help of the Hyperbola and its Afymptotes, calculated two Tables, one fhewing the Altitude to given Heights of Mercury, the other the Heights of Mercury at given Altitudes. Thefe Tables, the firft that ever were calculated, together with the Doctor's whole Method of proceeding, and an ingenious Attempt of his to difcover the true Reafon of the Rife and Fall of Mercury upon Change of Weather, were printed in the *Philofophical Tranfactions* *, and the Tables themfelves were very lately re-printed, with fome Obfervations upon them, by Dr. *Defaguliers* †.

In the Year 1703, when the *Meridian* Line, firft begun by *M. Picard* in 1669, afterwards continued in 1683, was farther purfued, feveral Obfervations of this Kind were made, and the Heights of feveral confiderable Mountains, particularly in the Southern Parts of *France,* determined as well by Trigonometrical as Barometrical Obfervations. Monfieur *Caffini* the Younger took that Opportunity to compare thefe Obfervations

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* Nº 181. *pag.* 106;   † Phil. Tranfact. Nº 386.

with

with the Rules laid down by *M. Mariotte* *, in order to which, and conform to the faid Rules, he calculated two Tables, one fhewing the Height of the Atmofphere ,as it anfwers to every Line of Mercury in the Barometer, the other determining the Height of the Atmofphere above the Level of the Sea at given Altitudes of Mercury. But having afterwards, upon Comparifon, found that the Obfervations made in 1703, did not in the Main agree with the Rules of *M. Mariotte*, and that the Heights of Places, as they appeared by thofe Obfervations, exceeded, generally fpeaking, the Numbers refulting from the Tables made by him according to the faid Rules, he thought it neceffary to calculate two new ones, wherein indeed the Refults are confiderably greater than in the Tables framed according to the Rules of *M. Mariotte*; infomuch, that for Inftance, a Place, where the Mercury falls to 22 Inches, rifes above the Level of the Sea, according to *Mariotte*, 852 Toifes, or 5112 *Paris* Feet; and, according to *Caffini*, 1158 Toifes, or 6948 Feet, which makes a Difference of 1836 *Paris* Feet, or 306 Toifes. Dr. *Defaguliers*, in his Differtation concerning the Figure of the Earth †, hath already fhewn how far the Obfervations made by the Gentlemen, that drew the *Meridian* acrofs the Kingdom of *France*, differ from each other; infomuch, that there are not two in nine, where the Number of Toifes, faid to correfpond to the Heights of the Barometer, agree together; and that confequently the Heights of Mountains, as determined by thefe Obfervations, are little to be depended on.

* Memoires de l' Acad. Royale, 1705. *pag.* 61. & feq.   † Phil. Tranf. N° 386. *pag.* 211.

My

My Father, Dr. *J. J. Scheuchzer*, in his Journeys over the Mountains of *Swifferland*, as they were more particularly calculated for the Improvement of Natural Philofophy in its feveral Branches, neglected no Opportunity, along with his other Obfervations, to make fuch Experiments with the Barometer, as might ferve to illuftrate the Qualities of the Air, to fettle the refpective Heights of Places, and particularly to fhew, how much our Mountains rife, as well above the Level of the Sea, as above other neighbouring Mountains in *France, Italy, Spain,* &c. Many of thefe Obfervations are fcattered up and down in his Writings, particularly his *Itinera Alpina,* and the feveral Parts of his *Natural Hiflory of Swifferland,* which laft Work was publifhed in *High German.* It would be too tedious to mention all the Experiments he made at different Times, and upon different Mountains. But my Defign in this Paper requires me to be particular in one, which for the Height meafured both with the Line and Barometer is, I believe, the moft confiderable that ever was made, and which enabled him more particularly to examine the two Tables made by *Caffini* the Younger, according to the Rules of Mr. *Mariotte,* and the Obfervations made by him and others, when the *Meridian* Line was perfected in 1703.

This curious Experiment was made in the Year 1709, at *Pfeffers,* a celebrated Mineral Water in the County of *Sargans,* at the Bottom and Top of a Mountain, which rifes from a fmall Brook, called the *Taminna,* to the Height of 714 *Paris* Feet, as appeared by letting a Line drop down perpendicularly from a Tree at Top full to the Bottom. At the Bottom of this Mountain, near the *Taminna,* the Mercury was by repeated Ex-
<div align="right">periments</div>

periments obferved at 25″, 9⅓‴, and at the Top it defcended to 24″, 11¼‴, fo that it fell juft 10 Lines, for 714 Feet, which gives about 71 *Paris* Feet for a Line, if the Heights anfwering to every Line were fuppofed to be equal.

I muft here once for all defire the Reader to take Notice, that I have made ufe in this Paper of *Paris* Meafure, namely, of Toifes (°) Feet (′) Inches (″) and Lines (‴). Every Toife is reckoned at fix Foot, the Foot is divided into twelve Inches, and the Inch into twelve Lines.

The Heights of the Barometer at the Bottom and Top of the Mountain being thus given, the Height of it fhould be, according to *M. Mariotte*, 116°, 0′, 8″, 11‴, or 696 *Paris* Feet, 8″, 11‴, which falls 17′, 3″, 1‴, fhort of the true Height, and according to *Caffini* 153° 3′, 8″, that is, 921 *Paris* Feet, 8″, which exceeds the true Height by 207 *Paris* Feet, 8 Inches; whereby it appears, that the Table made according to the Rules of *Mariotte* is much preferable to that of *Caffini* the Younger. The fame was likewife confirmed by another Experiment made in *June* 1715, upon the Steeple of our Cathedral at *Zurich*. At the Foot of the Steeple the Barometer ftood at 26″, 10‴, and at the Top at 26″, 7½‴, and the Height of the Steeple was found by the Line of 241 *Paris* Feet, 4 Inches, which gives very near 69 *Paris* Feet for one Line. According to the Table of *Mariotte*, the Height of the Steeple fhould have been of 237 *Paris* Feet, according to *Caffini*, 265, and according to the new Calculation (of which by and by) made purfuant to the Experiments above, it comes to 243°, 16″, 2‴, or about two Foot more than the true Height.

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It appearing by the Experiments made at *Pfeffers*, that from 25″, 9⅓‴ the Barometer defcends to 24″, 11½‴, that is, juſt 10 Lines, for the Height of 714 Feet, and the Expanſions of the Air being reciprocally as the Heights of Mercury, my Uncle, Dr. *John Scheuchzer*, undertook, purſuant to theſe Principles, and the Properties of the Hyperbola, to calculate a new Table, after the following Method.

As the Difference of the Logarithms of the two given Heights of the Barometer 25″ 9⅓‴ and 24″ 11½‴, that is 309⅓ and 299ʹ, or	Is to Foot,	So the Difference of the Logarithms of the Height of Mercury near the Sea, 28″ 1‴ to any leſſer Height, as for Inſtance 28″ 0‴, that is 337 — 336, or	To the Height of the Atmoſphere above the Level of the Sea, as it anſwers to one Line of Mercury, is
928 — 898		1011 — 1008	
142717	714	12906	64ʹ, 6″, 9‴

Thus the Height of the Atmoſphere at 28″ appears to be of 10°, 4ʹ, 6″, 9‴, but, according to *Mariotte*, it is only of 10°, 3ʹ, or 63 Feet, and *Caſſini* ſuppoſes it only at 10°, or 60 Foot.

In like Manner the Height of the Atmoſphere, from 28″, 0‴, to 27″, 11‴ is found to be 64ʹ, 9″, 2‴. According to the ſame Rule half the Height of the Atmoſphere, that is, the Height of the Place, where the Mercury in the Barometer would defcend to 14 Inches, appears to be, 15060ʹ, 3″, 0‴, or 2510°, 0ʹ, 3″, 0‴. Still upon the ſame Principle the Mercury will defcend to one Line at the Height of 133,397 *Paris* Feet above the Level of the Sea, which make 22,232 Toiſes,
5 Feet,

5 Feet, or 11 *Paris* Miles (at 2000 Toifes the Mile)
232 Toifes, 5 Foot. But as in order to determine the
whole Height of the Atmofphere, the Logarithm of 1'''
ought to be deducted from the Logarithm of 336''' or
28'' 0''', and as that Logarithm is 00000, it follows
from thence, that beyond the Place, where the Mer-
cury would defcend to 1''', the Air is expanded into an
Indefinite Space.

For the Satisfaction of the Curious, I have added
the Tables themfelves, to wit, thofe which *Caffini* the
Younger calculated according to the Rules of *Mari-
otte*, thofe which he deduced from the Obfervations
made by the Gentlemen of the Royal Academy of
Sciences, who drew the *Meridian* Line, and thofe
which my Uncle calculated from the Obfervation made
at *Pfeffers* in 1709.

In another Paper on this Subject I intend to com-
pare the Height of Mountains, as determined by divers
antient and modern Writers, with the true Height of
them, as it appears to be by the Barometrical Obfervati-
ons, particularly thofe made by my Father on the high
Mountains of *Swifferland*.

II. *Obfervations of a Difference of Sex in* Mifleto,
in a Letter from the Reverend Mr. Edmund
Barrel *to Sir* Hans Sloane, *Bart*. &c.

S I R,

AFTER I had mentioned my being pretty well
affured, that the Plants of Mifleto were fome of
them Male, and fome Female; and had promifed to

com-